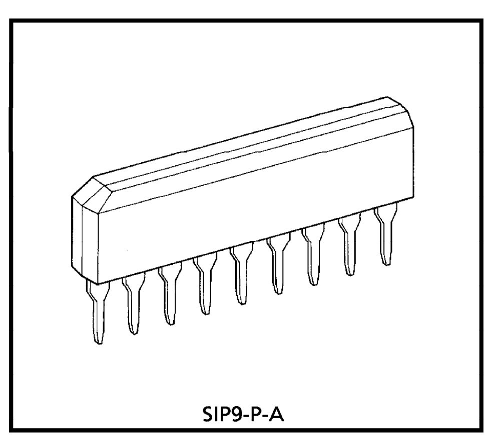
# TA7376P

SILICON MONOLITHIC

## AUDIO POWER AMPLIFIER

The TA7376P is dual audio power amplifier for portable products.



SIP9-P-A

Weight : 0.92g (Typ.)

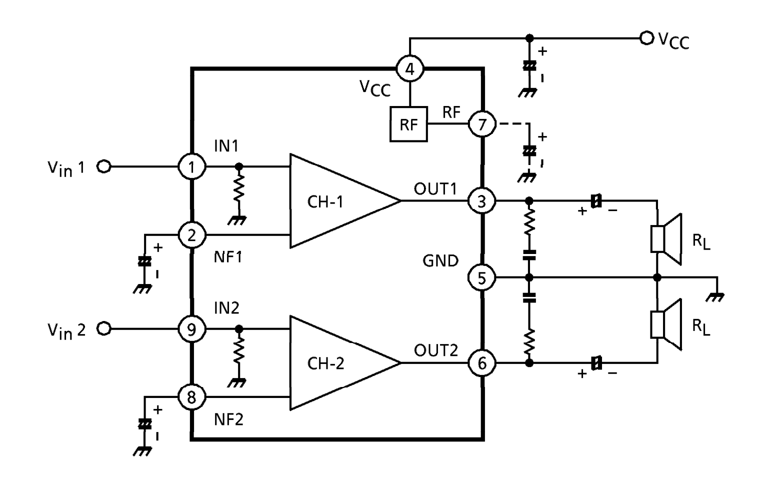
### FEATURES

- Low operating supply voltage : $V_{CC}$ = 1.8~6V (Ta = 25°C)
- Low quiescent current : $I_{CCQ}$ = 5.3mA ($V_{CC}$ = 4.5V)
- Including ripple filter circuit : RR = −42dB ($C_{RIP}$ = 10μF, $f_r$ = 100Hz)
- Voltage gain : $G_V$ = 39.5dB (Typ.)
- Very few external parts and small package. (SIP-9PIN)

**OUTPUT POWER TABLE** (THD = 10%, f = 1kHz, Stereo, Typ. value)

| $V_{CC}$ \ LOAD | $R_L$ = 32Ω | $R_L$ = 16Ω | $R_L$ = 8Ω | $R_L$ = 4Ω |
|---|---|---|---|---|
| 3V | 21mW | 38mW | 65mW | 100mW |
| 4.5V | 56mW | 100mW | 180mW | 300mW |
| 6V | 120mW | 230mW | 400mW | — |

### BLOCK DIAGRAM



## APPLICATION NOTE

1. Input stage

   The input stage of power amplifier (Equivalent Circuit) is comprised of a PNP differential pair ($Q_2$ and $Q_3$) preceded by a PNP emitter follower ($Q_1$) which allows DC referencing of the source signal to ground.
   This eliminates the need for an input coupling condenser.
   However, in case the brush noise of volume becomes a problem, provide serially a coupling condenser to the input side.

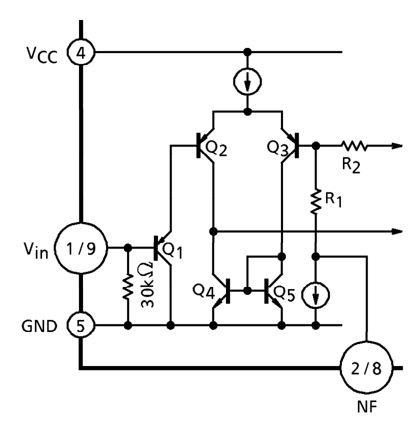



Fig.1

2. Adjustment of voltage gain

   The voltage gain is fixed at $G_V \fallingdotseq 40dB$ by the resistors ($R_1$ and $R_2$) in IC, however, its reduction is possible through adding $R_f$ as shown in Fig.2.
   In this case, the voltage gain is obtained by the following equation.

$$G_V \fallingdotseq 20\ell og \frac{R_1 + R_2 + R_f}{R_1 + R_f}$$

   It is recommended to use this IC with the voltage gain of $G_V \fallingdotseq 30dB$ or over.

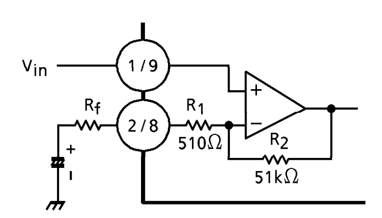



Fig.2

3. Ripple rejection ratio (RR)

   If the TA7376P does not have the ripple filter condenser ($C_{RIP}$), the ripple rejection ratio is as follow.
   RR = −25dB (Typ.)
   ($C_{NF} = 22\mu F$, $f_r = 100Hz$)
   RR = −34dB (Typ.)
   ($C_{NF} = 100\mu F$, $f_r = 100Hz$)
   If the ripple filter condenser is connected to the pin⑦, the ripple rejection ratio is improved as following the DATA ($RR - f_r$).

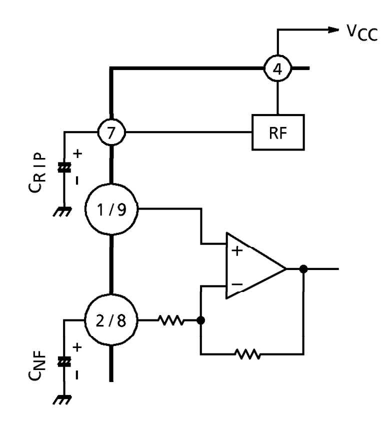



Fig.3

4. Pop sound

   It must be connected the condenser ($C_{RIP}$) from pin⑦ to GND, if the "Pop" sound is harshness.
   In this case, the value is $10\mu F$ something.

5. Phase-compensation

The purpose of condenser $C_1$ is to prevent oscillation.
These condenser need to be small temperature coefficient and excellent frequency characteristic. So ceramic condenser is unsuitable.
Condenser $C_2$ is rather large value than 10μF and GND line is better to short and wide lay-out so that the some common impedance are decreased.

Fig.4

**MAXIMUM RATINGS** (Ta = 25°C)

| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 8 | V |
| Power Dissipation | $P_D$ (Note) | 950 | mW |
| Operation Temperature | $T_{opr}$ | −25~75 | °C |
| Storage Temperature | $T_{stg}$ | −55~150 | °C |

(Note) Derated above Ta = 25°C in the proportion of 7.6mW / °C.

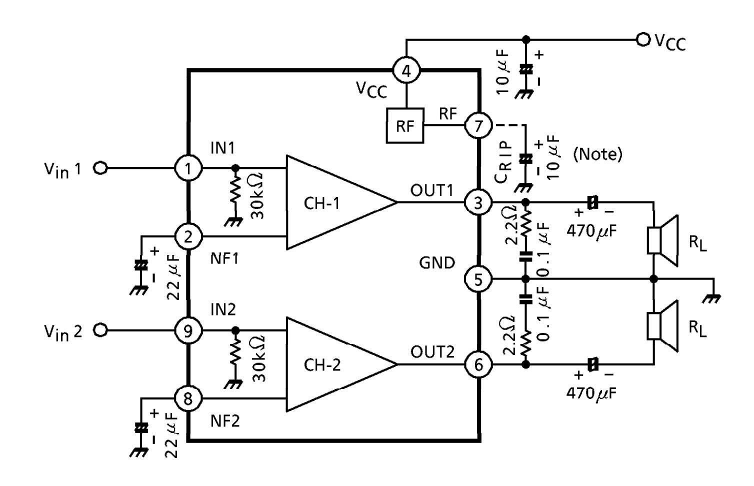
**ELECTRICAL CHARACTERISTICS**
(Unless otherwise specified, $V_{CC}$ = 4.5V, f = 1kHz, $R_g$ = 600Ω, $R_L$ = 4Ω, Ta = 25°C)

| CHARACTERISTIC | SYMBOL | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| Quiescent Current | $I_{CCQ}$ | — | $V_{in}$ = 0, $V_{CC}$ = 3V | — | 4.9 | 8.0 | mA |
| | | | $V_{in}$ = 0 | — | 5.3 | 10.0 | |
| | | | $V_{in}$ = 0, $V_{CC}$ = 6V | — | 5.7 | 14.0 | |
| Output Power | $P_{out}$ | — | $V_{CC}$ = 3V, $R_L$ = 4Ω, THD = 10% | 84 | 100 | — | mW |
| | | | $V_{CC}$ = 3V, $R_L$ = 32Ω, THD = 10% | — | 21 | — | |
| | | | $V_{CC}$ = 4.5V, $R_L$ = 4Ω, THD = 10% | 250 | 300 | — | |
| | | | $V_{CC}$ = 4.5V, $R_L$ = 8Ω, THD = 10% | — | 180 | — | |
| | | | $V_{CC}$ = 6V, $R_L$ = 8Ω, THD = 10% | — | 400 | — | |
| Total Harmonic Distortion | THD | — | $P_{out}$ = 100mW | — | 0.11 | 1.0 | % |
| Voltage Gain | $G_V$ | — | $V_{out}$ = 0.775$V_{rms}$ | 37.5 | 39.5 | 41.5 | dB |
| Output Noise Voltage | $V_{no}$ | — | $R_g$ = 10kΩ, BPF = 20Hz~20kHz | — | 0.21 | 0.7 | $mV_{rms}$ |
| Ripple Rejection Ratio | RR | — | $C_{RIP}$ = 10μF, $C_{NF}$ = 22μF $f_r$ = 100Hz, $V_r$ = 0.38$V_{rms}$ | — | −42 | −30 | dB |
| | | | $C_{RIP}$ = OPEN, $C_{NF}$ = 100μF $f_r$ = 100Hz, $V_r$ = 0.38$V_{rms}$ | — | −34 | — | |
| Cross Talk | CT | — | $V_{out}$ = 0.775$V_{rms}$ | — | −60 | −40 | dB |
| Input Resistance | $R_{IN}$ | — | — | — | 30 | — | kΩ |

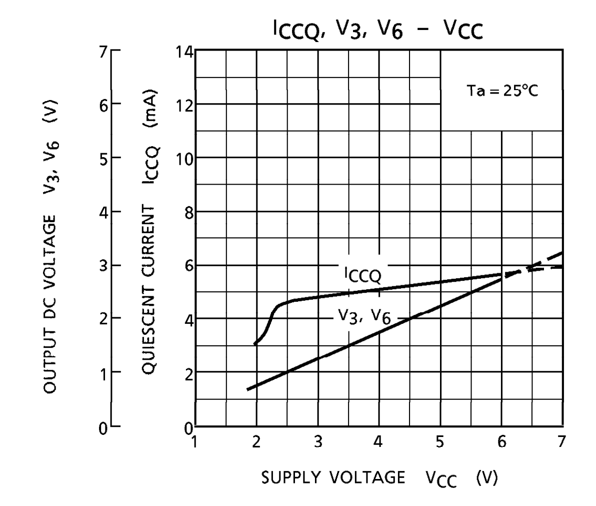
**QUIESCENT TERMINAL DC VOLTAGE** ($V_{CC}$ = 4.5V, Ta = 25°C, Typ. value) 〔UNIT : V〕

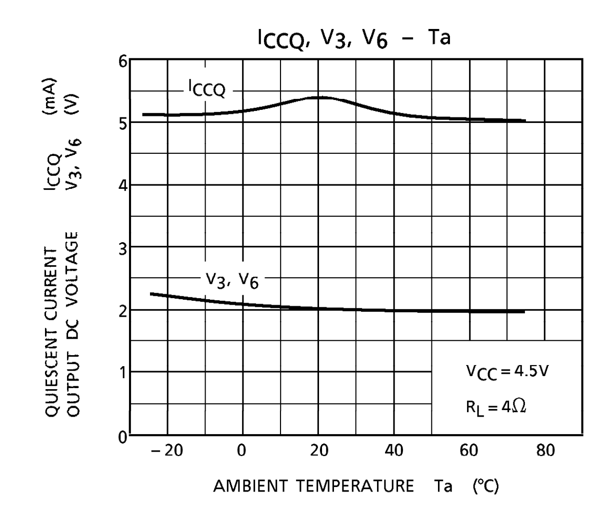
| TERMINAL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| VOLTAGE (V) | 0.003 | 0.59 | 1.98 | 4.5 | 0 | 1.98 | 1.28 | 0.59 | 0.003 |

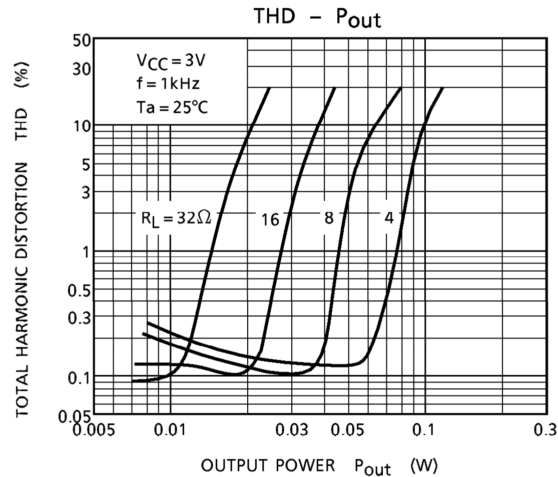
**TEST CIRCUIT**

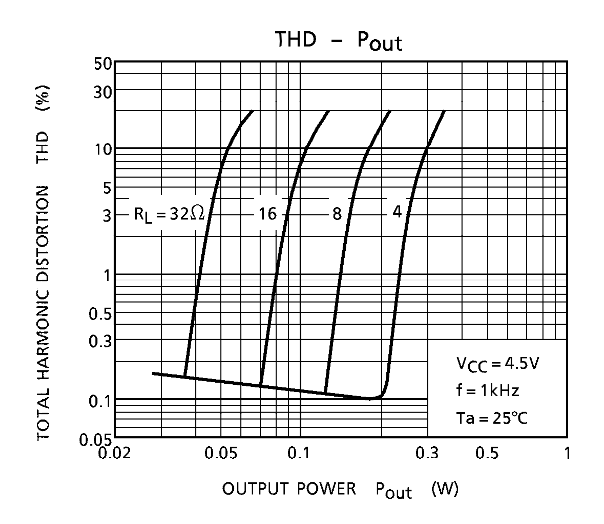


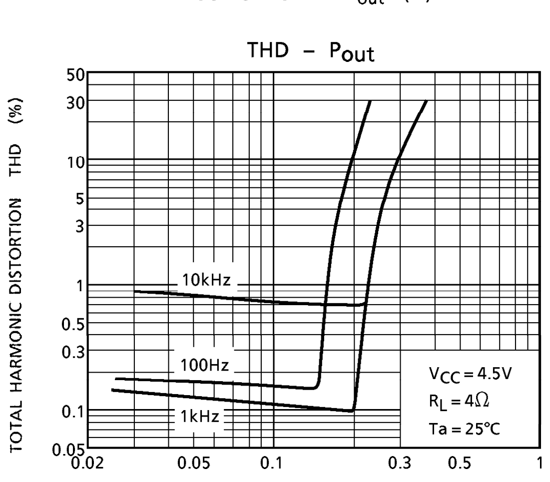

(Note) $C_{RIP}$ is shown in item 3 and 4 of APPLICATION NOTE.

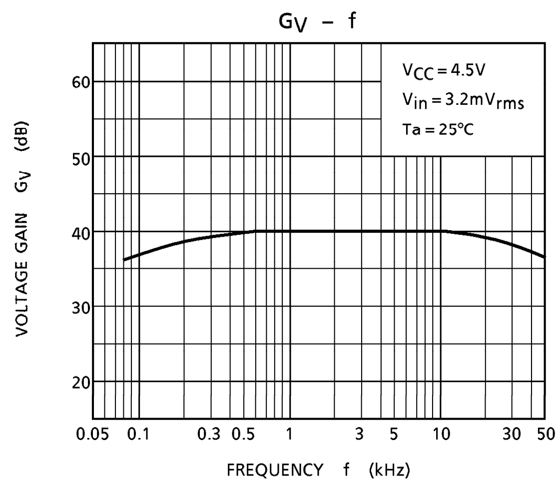


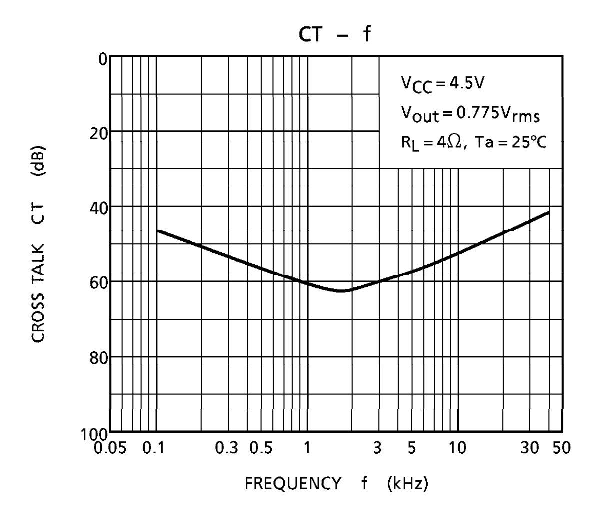



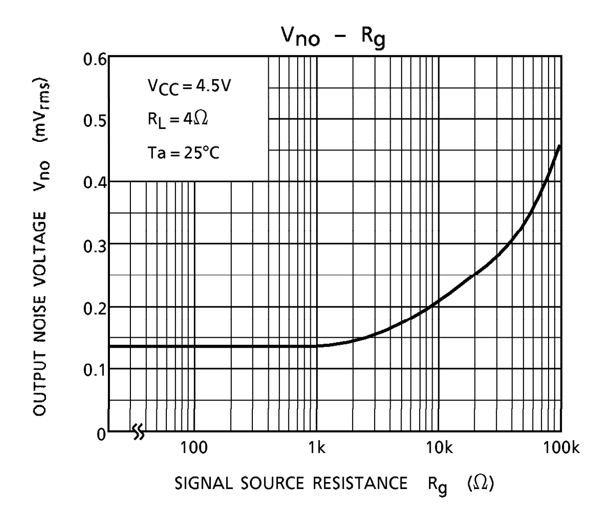

THD – Pout
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER Pout (W)
VCC = 3V
f = 1kHz
Ta = 25°C
RL = 32Ω
16
8
4
50
30
10
5
3
1
0.5
0.3
0.1
0.05
0.005
0.01
0.03
0.05
0.1
0.3

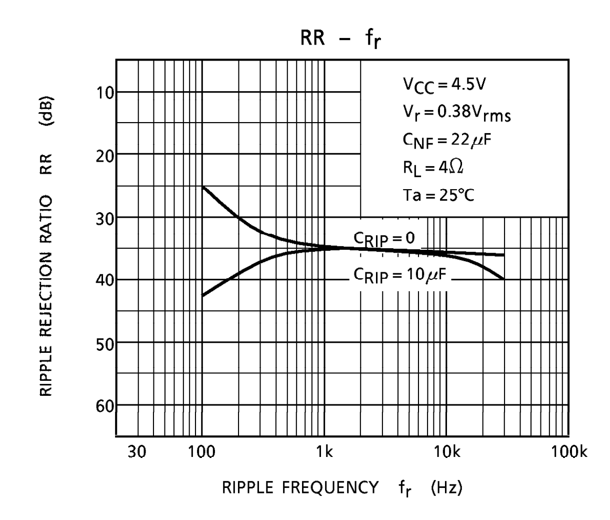

THD – Pout
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER Pout (W)
RL = 32Ω
16
8
4
VCC = 4.5V
f = 1kHz
Ta = 25°C
50
30
10
5
3
1
0.5
0.3
0.1
0.05
0.02
0.05
0.1
0.3
0.5
1

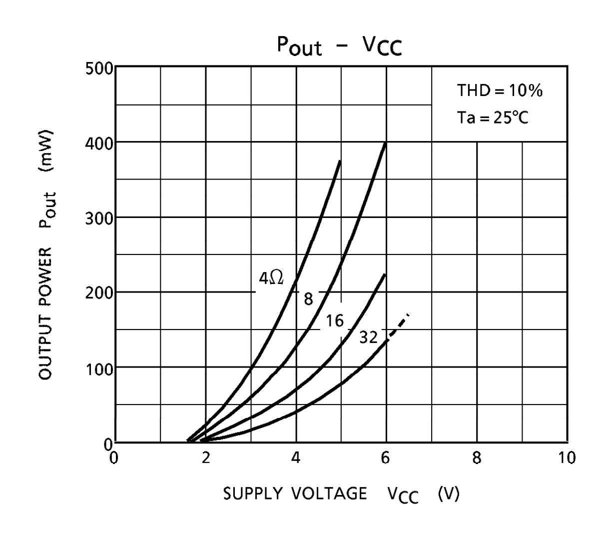

THD – Pout
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER Pout (W)
10kHz
100Hz
1kHz
VCC = 4.5V
RL = 4Ω
Ta = 25°C
50
30
10
5
3
1
0.5
0.3
0.1
0.05
0.02
0.05
0.1
0.3
0.5
1

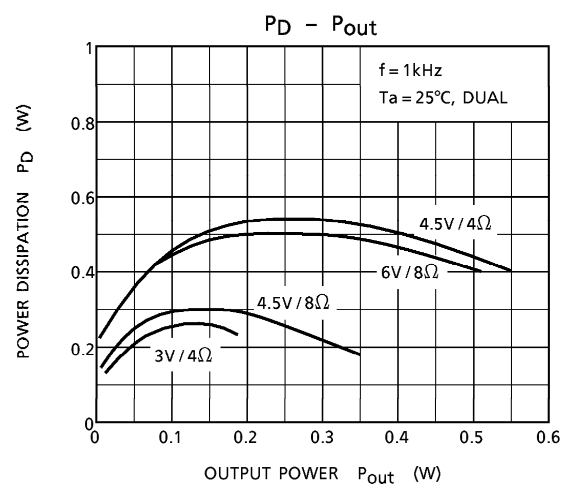

GV – f
VOLTAGE GAIN GV (dB)
FREQUENCY f (kHz)
VCC = 4.5V
Vin = 3.2mVrms
Ta = 25°C
60
50
40
30
20
0.05
0.1
0.3
0.5
1
3
5
10
30
50

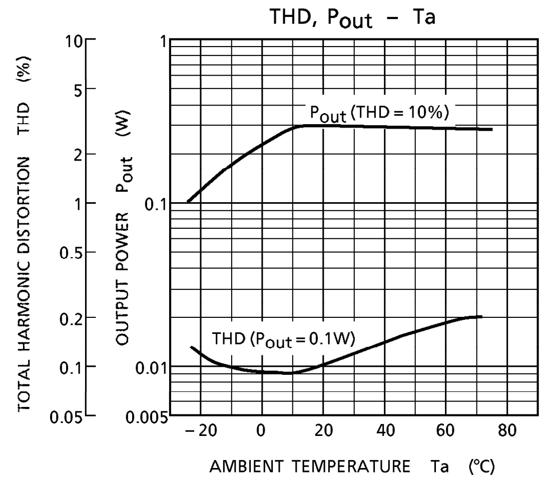

CT – f
CROSS TALK CT (dB)
FREQUENCY f (kHz)
VCC = 4.5V
Vout = 0.775Vrms
RL = 4Ω, Ta = 25°C
0
20
40
60
80
100
0.05
0.1
0.3
0.5
1
3
5
10
30
50

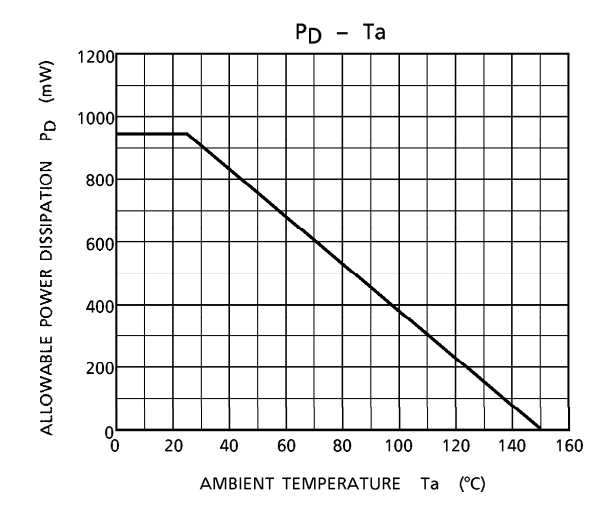

Vno – Rg
OUTPUT NOISE VOLTAGE Vno (mVrms)
SIGNAL SOURCE RESISTANCE Rg (Ω)
VCC = 4.5V
RL = 4Ω
Ta = 25°C
0.6
0.5
0.4
0.3
0.2
0.1
0
100
1k
10k
100k


RR – fr
$V_{CC}$ = 4.5V
$V_r$ = 0.38$V_{rms}$
$C_{NF}$ = 22μF
$R_L$ = 4Ω
Ta = 25°C
$C_{RIP}$ = 0
$C_{RIP}$ = 10μF
RIPPLE REJECTION RATIO RR (dB)
RIPPLE FREQUENCY $f_r$ (Hz)


$P_{out}$ – $V_{CC}$
THD = 10%
Ta = 25°C
4Ω
8
16
32
OUTPUT POWER $P_{out}$ (mW)
SUPPLY VOLTAGE $V_{CC}$ (V)

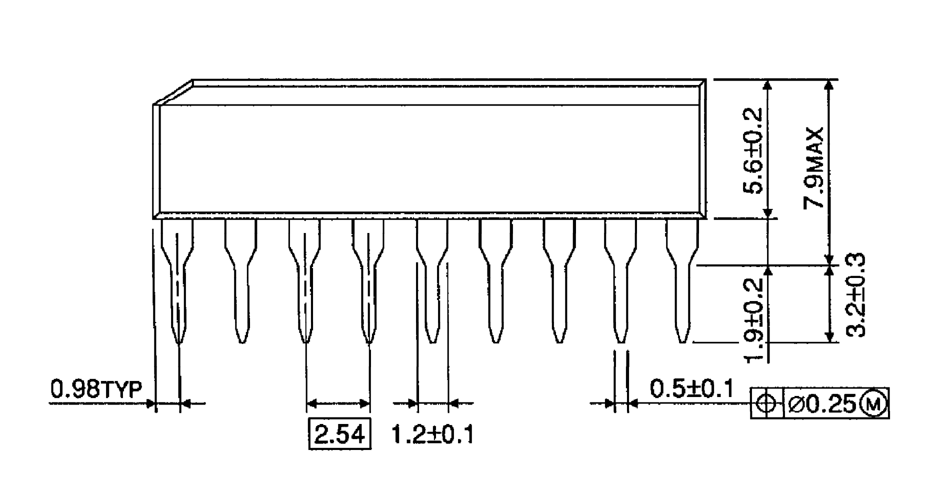

$P_D$ – $P_{out}$
f = 1kHz
Ta = 25°C, DUAL
4.5V / 4Ω
6V / 8Ω
4.5V / 8Ω
3V / 4Ω
POWER DISSIPATION $P_D$ (W)
OUTPUT POWER $P_{out}$ (W)

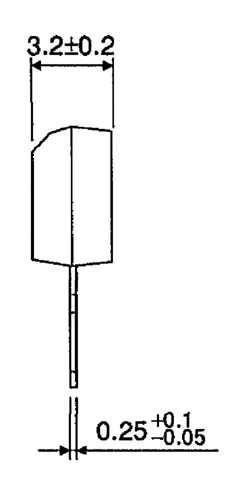

THD, $P_{out}$ – Ta
$P_{out}$ (THD = 10%)
THD ($P_{out}$ = 0.1W)
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER $P_{out}$ (W)
AMBIENT TEMPERATURE Ta (°C)

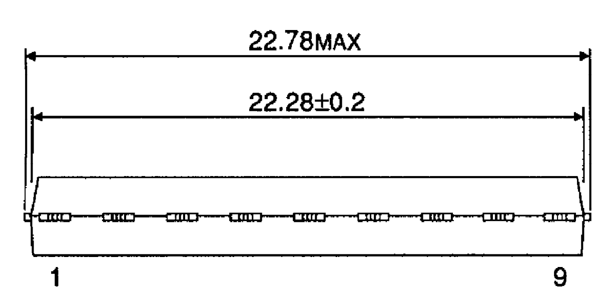

$P_D$ – Ta
ALLOWABLE POWER DISSIPATION $P_D$ (mW)
AMBIENT TEMPERATURE Ta (°C)

**OUTLINE DRAWING**
SIP9-P-A

Unit : mm




Weight : 0.92g (Typ.)